12. CROP FINANCIAL GROSS MARGIN

12.1 Definition

The term profit is reserved to describe the net benefit of all the trading by the farm. Gross margin (GM) may loosely be thought of as "profit" of a particular crop or a livestock enterprise on the farm, but in reality it is a unit rate. It is defined as the difference between the gross output (the total revenue from the enterprise, discussed in Section 10), and the total variable cost (discussed in Section 11). The basis of the calculation for crop enterprises is the unit of crop area, the hectare, and the currency adopted here is US$ to allow comparability between republics and international values. This gross margin is a return to land and the greater it is, the greater contribution the enterprise makes to the overall farm profit where there are no other constraints to production.

Although the basis of the calculation is unit area of crop, the gross margin can be expressed as a return to other resource inputs, such as water, tractors and labour. In this case the GM in $/ha is divided by the physical units of the specific resource that was used as a variable cost, for example, giving GM in terms of $/tcm of irrigation water. However, when cash is short, a more useful estimate is the financial return to a unit of financial input. For example, if fertiliser is an expensive component of total variable cost, the return to investment of cash to buy fertiliser is the GM minus the cost of the fertiliser used to produce the crop divided by the investment in fertiliser, all units in $/ha, times 100. The result is the percentage financial return to investment in fertiliser and is a useful tool for management, particularly in a free market economy. Firstly, it may be compared with equivalent values for the other specific inputs, and secondly it is the basis for investigating the return to different rates of fertiliser aimed at finding an optimum rate. In addition to full financial data and in order to make this latter calculation meaningful, it is desirable to have some data on the physical response of the crop to different rates of fertiliser in the specific location. If actual rate of usage is very low, for example of pesticide, then the return can be a very high percentage of the cost. It should be noted, however, that a small rate increase in pesticide use substantially reduces the percentage financial return. These data are useful for planning purposes but must be used with discretion.

12.2 Reliability of Gross Margin Estimates

Measured inputs and output in each of the 10 sample fields on each farm are available in the WUFMAS database. They are used, together with average prices for each republic, to estimate the total variable cost of production and gross output in each field. Statistical error may result from the measurement of physical quantities in the field, recording and processing these data, and in the unrepresentativeness of an average price for that farm or field. Every effort has been made to validate data, check records with enumerators and replace them where absolutely necessary. Comprehensive validation programming for the database is not yet complete and a few errors, particularly of data that enumerators failed to record, may still exist.

Means of gross margin estimates for the four main crops clearly are more reliable than the others. Table 12.1 gives the number of sample fields on which the gross margin means are based, and the values of the four crops that are most represented are shown in bold. Upland cotton, winter wheat, lucerne and rice account for 86 percent of sample fields in the WUFMAS 1997 survey, and this value is not dissimilar to the proportion of irrigated land that these crops occupy in Central Asia. Ratios vary somewhat between republics, with cotton being relatively more important on the Uzbekistan sample farms and least important in Turkmenistan. Winter wheat was most important on the Turkmenistan farms but hardly a

significant crop on the Kazakhstan farms due to competition with rainfed wheat from the northern steppe.

Table 12.1 Number of Crop Sample Fields

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Total
Apple	1					1
Apricot			4			4
Barley, winter					1	1
Cotton, pima				3	1	4
Cotton, upland	**15 (35%)**	**13 (33%)**	**10 (40%)**	**6 (30%)**	**53 (48%)**	**97 (41%)**
Curcurbits					1	1
Gram, green			1			1
Lucerne + Barley, spring		1				1
Lucerne + Wheat, winter	1					1
Lucerne, mature	**6 (14%)**	**5 (13%)**	**1 (4%)**	**3 (12%)**	**9 (8%)**	**24 (10%)**
Lucerne, young	1				1	2
Maize, grain	1	4	1		1	7
Maize, silage					3	3
Oats		1				1
Onion		1	1			2
Rice	**14 (33%)**				**11 (10%)**	**25 (11%)**
Sorghum			1			1
Sugarbeet		1				1
Sunflower, for oil	1					1
Tobacco		1				1
Wheat, spring	1					1
Wheat, winter	**2 (5%)**	**13 (33%)**	**6 (24%)**	**8 (40%)**	**29 (26%)**	**58 (24%)**
Grand Total	43	40	25	20	110	238
Overall Crop Intensity	108%	100%	125%	100%	110%	108%

12.3 Cropping Intensity

Overall cropping intensity is shown in Table 12.1. Only one crop per year was produced on the sample fields in Kyrgyzstan and Turkmenistan. In the command economies, there is little incentive to do otherwise and the duration and intensity of the Central Asian winter is certainly a disincentive to increase productivity by double cropping in a year. The duration of cotton and rice crops is too long to allow regular winter cropping, but winter wheat and lucerne are planted after harvest of these crops. Similarly, the harvest of winter wheat in June is too late for successful cropping by cotton and rice in that season. Farms in three republics showed cropping intensities over 100 percent as a result of their crop rotations.

12.4 Crop Gross Margins

12.4.1 Return to Land

Land is the main factor of production and the values of average crop gross margin by the republics are given in Table 12.2 but detailed crop budgets are available for each crop on each sample farm in Appendix 7.

In accordance with the general observation on inputs and yields, the differences between farms in crop gross margins are highly significant (more than P=1 percent) but the means over the farms in each republic mostly are not significantly different. Cotton is an exception as differences between republic means are also highly significant.

Not only is cotton still the most commonly grown crop in the region but this is justified by virtue of it having by far the largest gross margin of the main crops. Its gross margin is consistently good, even in the command economies of Turkmenistan and Uzbekistan, where Government price fixing markedly reduces the gross margins. Rice has good gross margins in Kazakhstan and Uzbekistan where it was grown on sample fields, due to the buoyant price for the product. The implications of the negative gross margins for winter wheat and lucerne

are serious for Tadjikistan, Turkmenistan and Uzbekistan where these crops are mostly a drain on the national economy. Lucerne in Turkmenistan showed a good gross margin due to the high price for fresh lucerne that was reported for that republic. Most fodder crops give negative or at best, small positive gross margins, and maize, like most cereal crops (except rice), performs badly.

Table 12.2 Average Crop Gross Margins
(US$/ha)

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Overall
Apple	1,883					1,883
Apricot			84			84
Barley, winter					45	45
Cotton, pima				687	356	604
Cotton, upland	**819**	**782**	**537**	**555**	**239**	**452**
Curcurbits					205	205
Gram, green			224			224
Lucerne + Barley, spring		-226				-226
Lucerne + Wheat, winter	-166					-166
Lucerne, mature	**325**	**25**	**-140**	**295**	**-296**	**6**
Lucerne, young	365				-222	71
Maize, grain	-49	205	60		280	159
Maize, silage					-142	-142
Oats		312				312
Onion		6	765			385
Rice	**209**				**324**	**259**
Sorghum			-138			-138
Sugarbeet		1,908				1,908
Sunflower, for oil	-96					-96
Tobacco		936				936
Wheat, spring	-67					-67
Wheat, winter	**95**	**225**	**-52**	**-40**	**-48**	**19**
Overall average	447	424	246	298	113	255

12.4.2 Return to Water

The financial return per unit of irrigation water used to grow the crops is shown in Table 12.3.

Table 12.3 Gross Margin Return to Water Used
(US$/tcm)

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Overall
Apple						
Apricot			8			8
Barley, winter					21	21
Cotton, pima				65	71	66
Cotton, upland	**186**	**83**	**40**	**97**	**51**	**78**
Curcurbits					83	83
Gram, green			10			10
Lucerne + Barley, spring						
Lucerne + Wheat, winter	-167					-167
Lucerne, mature	**162**	**19**	**-10**	**167**	**-256**	**-42**
Lucerne, young					-4,624	-4,624
Maize, grain	-9	31	6		51	25
Maize, silage					-167	-167
Oats		178				178
Onion		1	191			96
Rice	**12**				**25**	**17**
Sorghum			-10			-10
Sugarbeet		283				283
Sunflower, for oil						
Tobacco		61				61
Wheat, spring	-58					-58
Wheat, winter	**163**	**54**	**-32**	**-5**	**-28**	**-7**
Overall average	95	68	17	62	-52	10

Returns to irrigation water used are highest in Kazakhstan, due to a combination of slightly higher gross margins and lower rates of water use. Farms in Kyrgyzstan and Turkmenistan also achieved good overall returns to irrigation water, with only wheat in Turkmenistan giving a poor return because of the low state order price for wheat. In Tadjikistan the relatively good performance of onion and cotton was offset by poor results on other crops. Overall performance was poor in Uzbekistan, resulting from relatively heavy rates of water use in combination with relatively poor gross margins, particularly of lucerne.

12.4.3 Return to Working Capital

The gross margin in $/ha expressed as a ratio of the Total Variable Cost also in $/ha is the financial return to unit investment in growing the crop, $ return/$ invested. It is also termed the benefit:cost ratio, although this is normally used to express the return from the whole farm in relation to the annual investment. Expressed as a percentage, it is comparable with the prevailing rate of interest, which it should exceed if the investment is to be a prudent one. Table 12.4 gives the mean benefit:cost ratios for the crops by republic.

Table 12.4 Average Benefit:Cost Ratio for Crop Production

Crop	Kazakhstan	Kyrgyzstan	Tadjikistan	Turkmenistan	Uzbekistan	Overall
Apple	34.2					34.2
Apricot			2.5			2.5
Barley, winter					0.3	0.3
Cotton, pima				2.2	0.8	1.9
Cotton, upland	**3.1**	**1.5**	**1.5**	**2.3**	**0.6**	**1.3**
Curcurbits					0.8	0.8
Gram, green			1.7			1.7
Lucerne + Barley, spring		-1.0				-1.0
Lucerne + Wheat, winter	-1.0					-1.0
Lucerne, mature	**5.7**	**0.3**	**-0.5**	**1.8**	**-0.3**	**1.6**
Lucerne, young	2.7				-0.8	0.9
Maize, grain	-1.0	2.1	1.3		1.5	1.4
Maize, silage					-0.8	-0.8
Oats		1.1				1.1
Onion		0.0	3.1			1.6
Rice	**0.6**				**0.4**	**0.5**
Sorghum			-0.8			-0.8
Sugarbeet		10.2				10.2
Sunflower, for oil	-1.0					-1.0
Tobacco		1.8				1.8
Wheat, spring	-0.3					-0.3
Wheat, winter	**0.4**	**0.8**	**-0.3**	**-0.2**	**0.0**	**0.1**
Overall	2.9	0.9	1.1	1.2	0.3	1.0

Overall average return to investment in crops was much greater in Kazakhstan, the newly liberalised economy, than in the other republics, but this was partly due to high returns on apples and lucerne. However, the return on cotton crops was extremely good also. Uzbekistan has the poorest performance overall with an average return of 30 percent, yet well above the current rates on international loans. Fruit and vegetable crops have excellent returns but they are vulnerable to market conditions. Sugarbeet and tobacco in Kyrgyzstan gave excellent returns, but they may not be sustainable.

Some fields were planted and cultivated but then abandoned due to poor growth so that there is a real variable cost yet zero gross output. Their real TVC values, negative GM values and their zero GO values were included in calculating the mean values for the farms and republics. In this situation, the gross margin is equal to the TVC, and the minimum ratio therefore is –1, as for sunflower in Kazakhstan.

12.5 Returns to Inputs

Table 12.5 summarises the returns that on average over all sample fields each crop gives to the six groups of inputs.

Table 12.5 Overall Crop Return to Inputs
($ return/$ input)

Crop	Seed	Fertiliser	Machinery	Labour	Agrochem	Water
Apple			46	142		
Apricot			6	11		13
Barley, winter	7	3	1	25		31
Cotton, pima	22	30	4	11		100
Cotton, upland	**32**	**20**	**4**	**8**	**125**	**65**
Curcurbits			2	8		117
Gram, green	15	26	3	47		16
Lucerne + Barley, spring	-3		0	-253		
Lucerne + Wheat, winter			0			-78
Lucerne, mature	**-54**	**-32**	**3**	**19**	**-61**	**-150**
Lucerne, young	6	-1	1	194		-6,511
Maize, grain	-1	5	2	-1	1	11
Maize, silage	-1	-4	0	-77		-235
Oats	9		2	335		21
Onion	6	8	9	44	60	148
Rice	**4**	**9**	**1**	**46**	**5**	**18**
Sorghum	-18	-7	0	-149		-15
Sugarbeet	110		21	131		33
Sunflower, for oil	-2	-4	-2	-6		
Tobacco	8	16	14	7		7
Wheat, spring	0		1	-132		-26
Wheat, winter	**0**	**38**	**1**	**-2**	**17**	**-29**
Overall	17	22	3	12	82	-24 (1)
Av. investment ($/ha)	43	39	214	30	11	15

The method of estimation is described above, but it should be noted that a very small input of a factor that is not yield-limiting produces a large return, even if the return is negative. These large values, for example in the returns to water, markedly weight the overall average shown at the foot of the table. (Value in brackets for water is the mean excluding the single high value for young lucerne.)

By far the largest investment, $214/ha on average, is in machinery and the average return to this factor, $3 per $ invested, is the second smallest. Conversely, only $11/ha was spent on agro-chemicals and this produced the largest average return of $82 per $ invested, because use of pesticides was not a factor that is seriously limiting yield.